

## ABSTRACT

The present invention provides an optical device and the like which can collect incident light at a high incident angle than an existing microlens, in order to realize a solid-state imaging 5 apparatus and the like corresponding to an optical system (an optical system with a high incident angle  $\theta$ ) with a short focal length for a thin camera.

Each unit pixel ( $2.8 \mu\text{m}$  square in size) is made up of a distributed index lens 1, a color filter 2 for green G, Al wirings 3, a 10 signal transmitting unit 4, planarizing films 5, a light-receiving device (Si photodiodes) 6, and a Si substrate 7. The distributed index lens 1 is made of high refractive index materials 33 [ $\text{TiO}_2$  ( $n=2.53$ )] and low refractive index materials 34 [air ( $n=1.0$ )] having concentric zones. Further, in a distributed refractive index 15 lens, a width 35 of adjacent divided areas is 200nm. Also, a film thickness  $t$  is  $0.5 \mu\text{m}$ .